

70-80 GHz for 5G densification

NOKIA

March 18<sup>th</sup>, 2019

© Nokia 2019

# Agenda

**Nokia and X-Haul**

**5G network trends  
and densification**

**E-band technology**

**Recent  
enhancements and  
E-band antennas**

**Conclusions**

# Mobile Network Xhaul Business Unit

## Nokia Microwave Worldwide



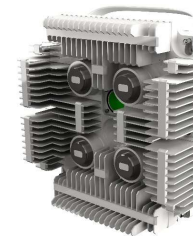
## Nokia Microwave presence in US

- Nokia Microwave #1 in US
- Over 60 years in the microwave business
- Main supplier to ATT, VzW and First Responder networks
- Nokia Microwave #1 in Vertical market

## 5G Engagement

First 5G site mid-hauled in Q418  
5G cities with MW

*US Canada Italy Germany Saudi ...*



UBT Twin



UBT S



UBT m 80

**NOKIA**

# Agenda

**Nokia and X-Haul**

**5G network trends  
and densification**

**E-band technology**

**Recent  
enhancements and  
E-band antennas**

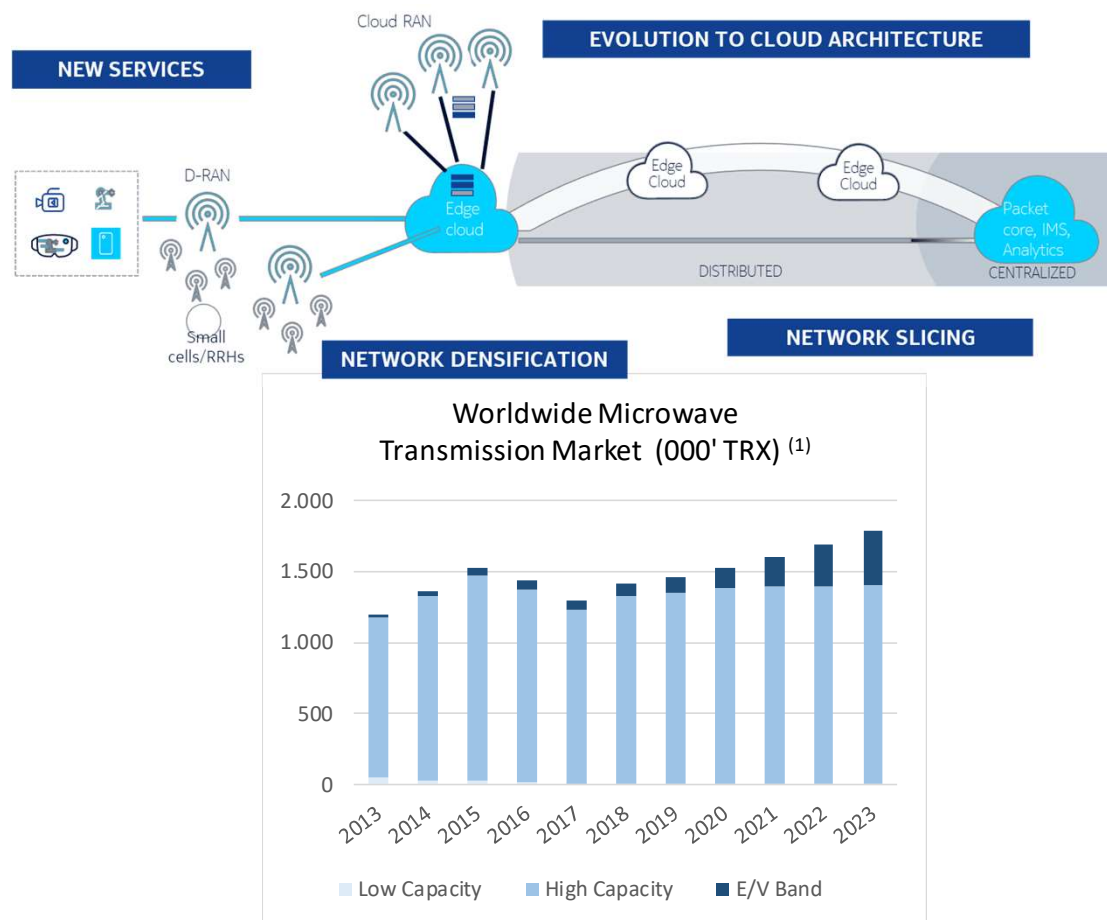
**Conclusions**

# 5G Network trends & Microwave Industry

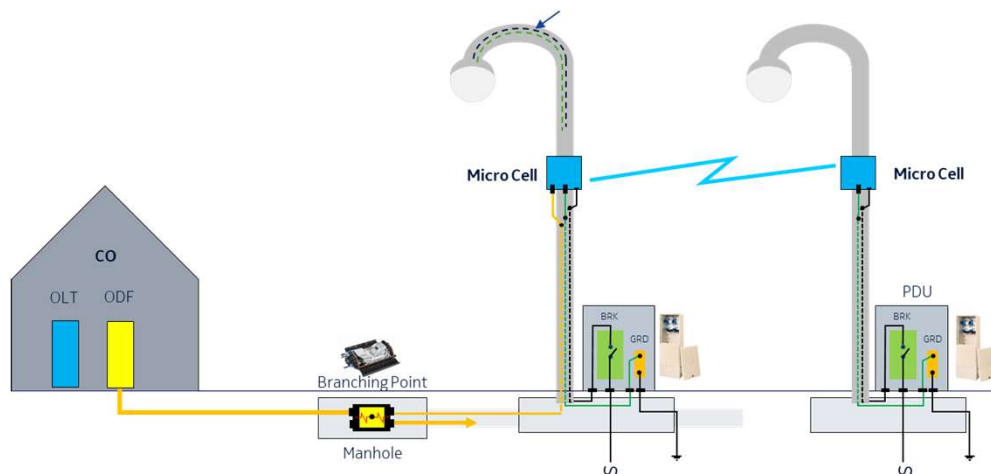
## Networks evolution

- Fiber penetration up
- Density up
- Coverage up

MW remains a key technology  
(already used today in more  
than 50% sites)



## 5G densification



Wireless connectivity/transport as **enabler for 5G:**

- fiber might not be available in the deployment area
- fiber PoP is just one or few hundred meters away from the radio access point

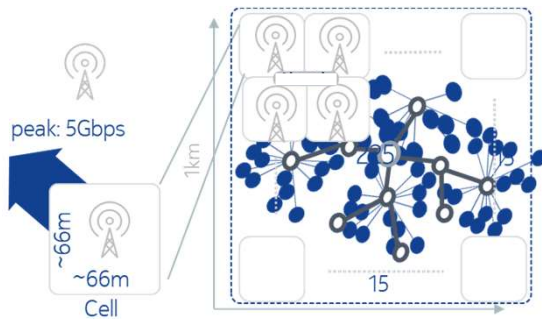


Estimation for US dense urban scenario which needs 5G deployment:  
**50% of sites not covered by fiber**  
(25% temporary, 25% long term)



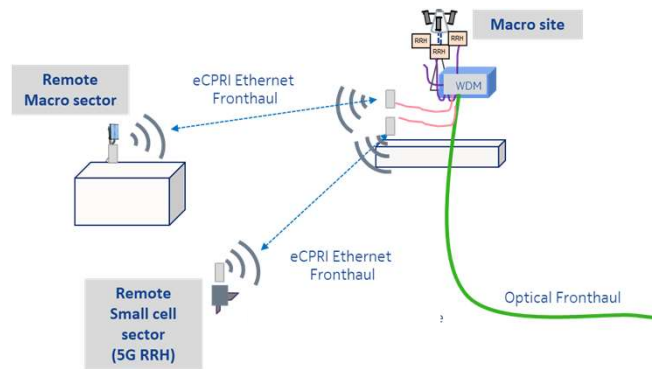
# 5G densification scenarios

## Mobile x-Haul



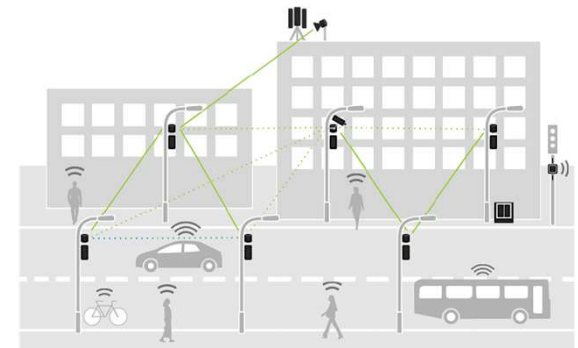
### 5G Millimeter-wave Wireless deployment

- 26/28/39 GHz
- **Backhaul / F1**



### Remote RRH Macro-sector /small cells

- Sub-6GHz RRH and Small cells (Micro RRH)
- **eCPRI fronthaul**



### Small Cells low power (street level)

- SUB-6GHz (or mmW)
- **Backhaul / F1**

# 5G Network trends & Microwave Industry

## Networks evolution

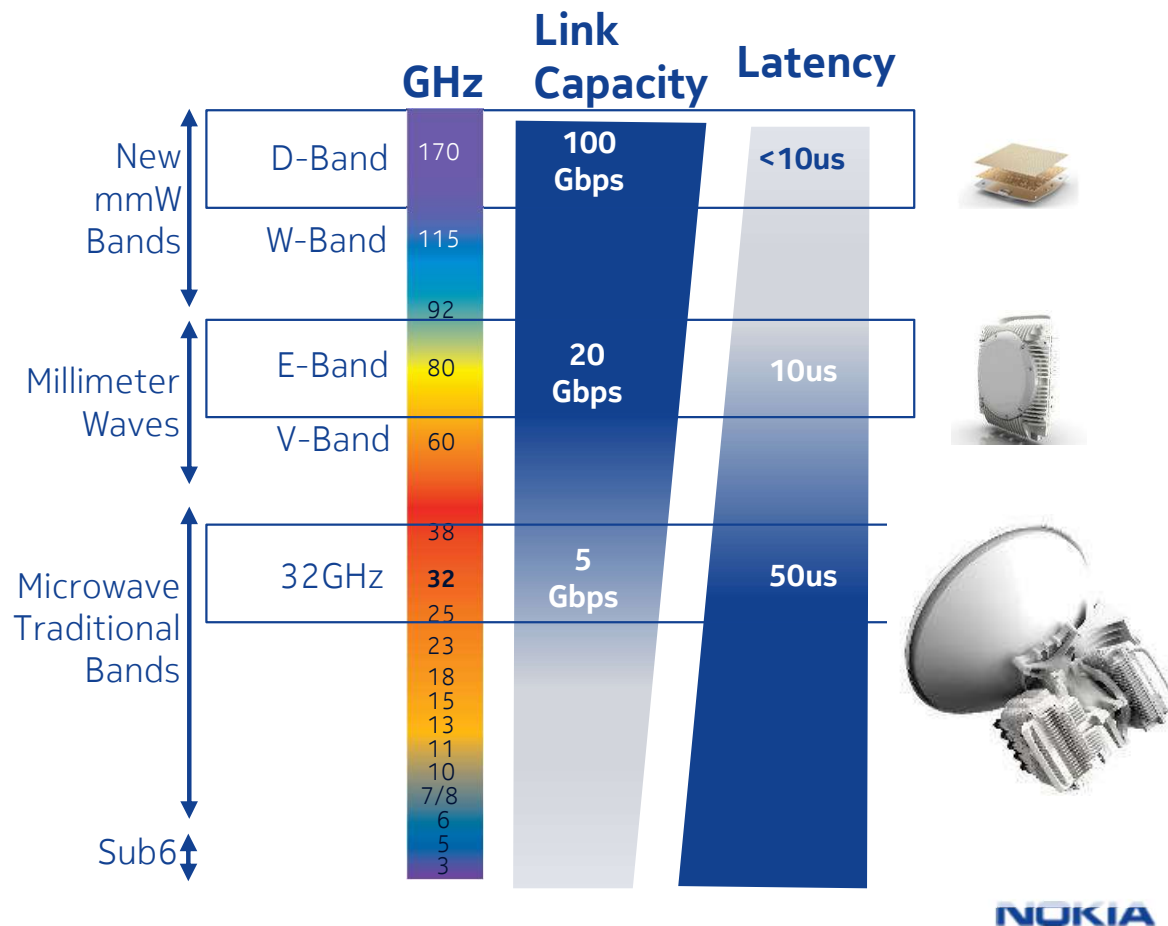
- Fiber penetration up
- Density up
- Coverage up

MW remains key technology

## Microwave technology

- More spectrum defined
- Silicon techno jumps

**> 10 Gps, 10  $\mu$ s of latency  
up to 100 Gps tomorrow**





# Agenda

**Nokia and X-Haul**

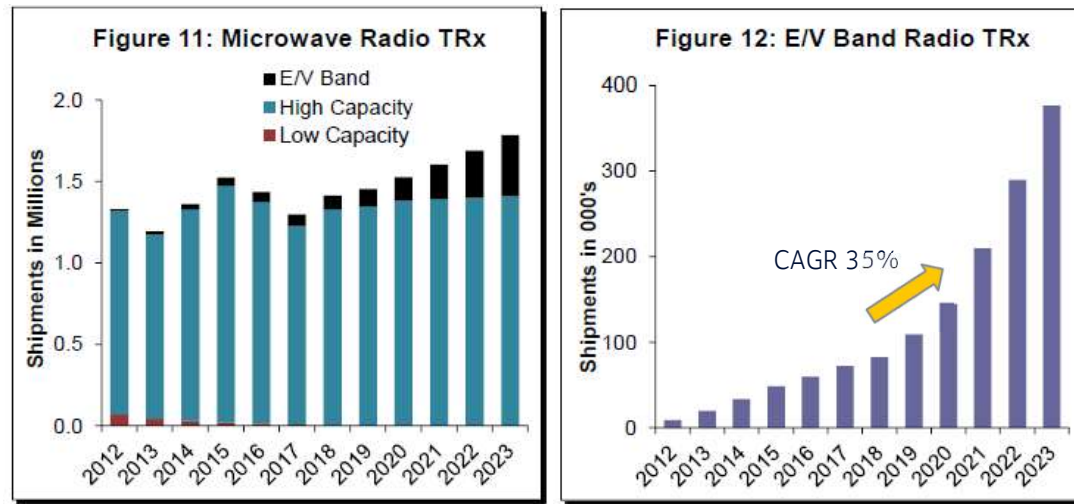
**5G network trends  
and densification**

**E-band technology**

**Recent  
enhancements and  
E-band antennas**

**Conclusions**

## E-band for transport



(Dell'Oro - 2019)

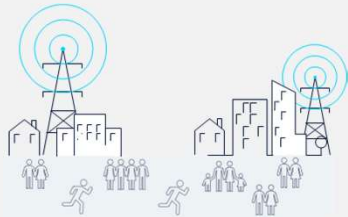
E-band is more and more exploited for last mile transport and for aggregation. This is coherent with network trends:

- Densification → shorter mmWave wireless transport links
- Capacity increase (and latency reduction) needs
- Ethernet fronthaul

E-band market growing +30% YoY

## E-band use cases

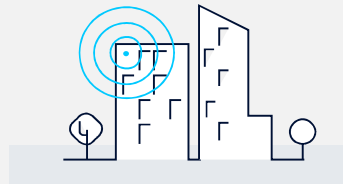
E-band going to become the most used frequency for wireless transport due to its versatility vs use cases:



### Suburban

- Up to 10 Gbps for 5G backhaul/midhaul up to 5 miles
- Carrier aggregation microwave + E-band

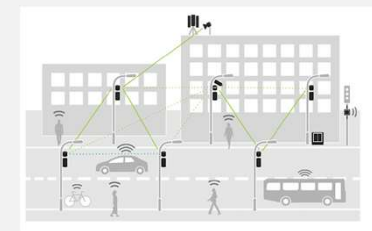
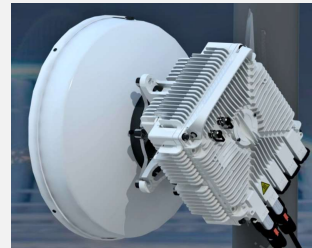
2ft dual band antenna



### Urban

- 10-20 Gbps for 5G backhaul/midhaul up to 2 miles
- E-band only

1ft/2ft antenna (43-50dBi)



### Dense urban

- 10/20 Gbps for 5G backhaul/midhaul/FH short distance @street level
- E-band only w/ High integration

38dBi embedded antenna



E-band flexibility addressing several use cases and 5G introduction (needed today)

# Agenda

**Nokia and X-Haul**

**5G network trends  
and densification**

**E-band technology**

**Recent  
enhancements and  
E-band antennas**

**Conclusions**

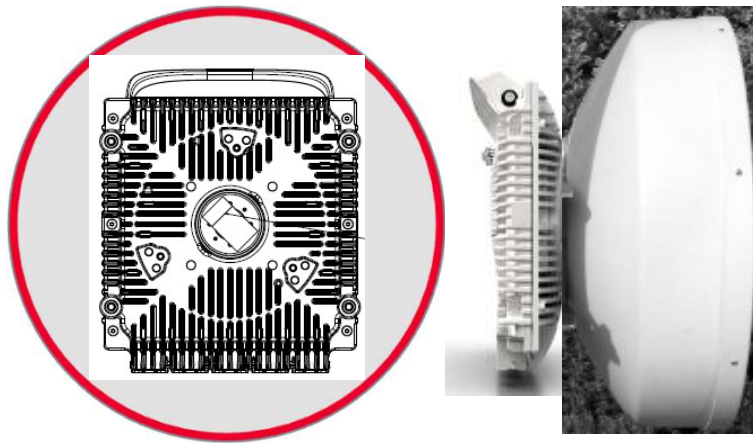
## E-band products

Main UBT-m characteristics:

- Ethernet transport for macro and small cells
- Up to 2GHz channels
- 10/20 Gbps bidirectional capacity
- Small form factor
- Embedded antenna option



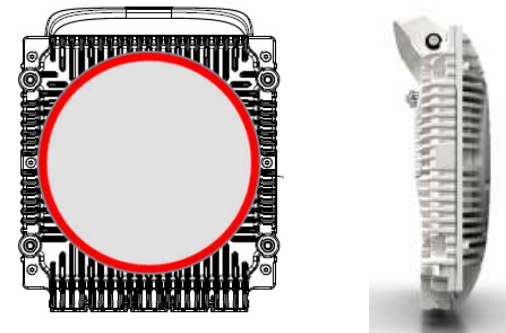
## E-band antenna evolution



**43dBi**

- Traditional parabolic antenna
- Very thick
- 43dBi
- 1 foot

VS

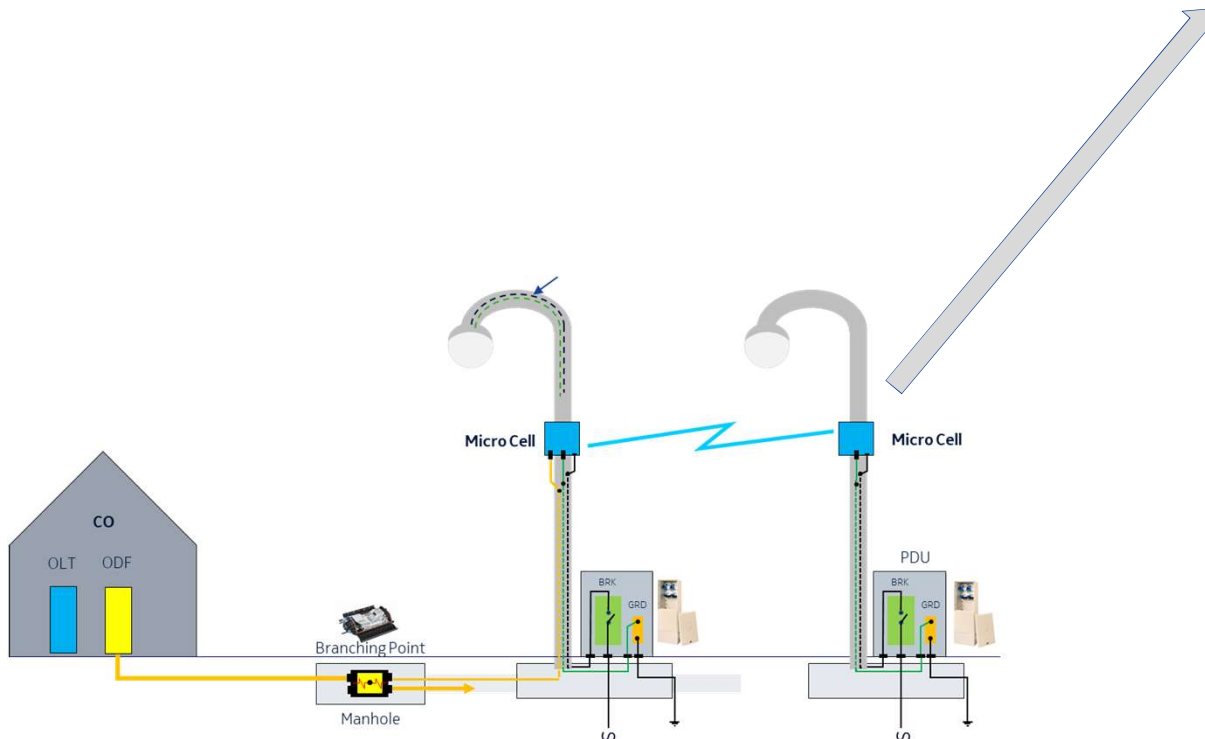


**38dBi**

- Innovative embedded antenna
- Minimal visual impact
- 38dBi
- 0.5 foot



## E-band antenna evolution



38dBi gain

Mandatory for street level application:

- 1) Visual impact
- 2) Weight/space and easy installation on street furniture
- 3) Site TCO
- 4) Pole vibrations support
- 5) 43dBi would be overdimensioned and would not support pole vibrations

No drawbacks as same spectral efficiency (thanks to EIRP reduction rule vs antenna gain)

## Previous FWCC proposal

We support previous FWCC proposal on this matter:

February 13, 2018: On behalf of the Fixed Wireless Communications Coalition, Inc. (FWCC),

**Re: WT Docket No. 10-153, *Amendment of Part 101 to Facilitate Wireless Backhaul***

**GN Docket No. 14-177, IB Docket No. 15-256, RM-11664, WT Docket No. 10-112, IB Docket No. 97-95, *Use of Spectrum Bands Above 24 GHz for Mobile Radio Services*, et al.**

The FWCC asks the Commission to act:

- Smaller antennas for fixed point-to-point operations
- **38dBi as minimum antenna gain in E-band**

## Worldwide regulation

Here is status in ETSI and Canada:

- The ETSI standards, which apply to dozens of countries across Europe, Africa, and Asia, are more relaxed than the Commission's; and the ETSI TM04 meeting in December 2017 proposed a further relaxation down to 30dBi.
- ISED Canada has issued its SRSP-371.0 standard with antenna requirements that are more relaxed than those in Part 101 (38dBi are allowed)

In previous proposal we asked the Commission to amend the current requirements to include both Category A and Category B antenna standards, in line with the rules for most other Part 101 bands. This would also better harmonize with Canadian requirements, which have Category A and B rules.

# Agenda

**Nokia and X-Haul**

**5G network trends  
and densification**

**E-band technology**

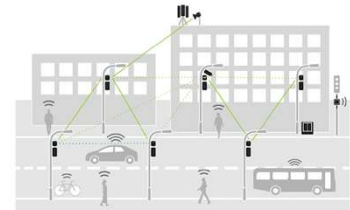
**Recent  
enhancements and  
E-band antennas**

**Conclusions**

# Conclusions

- Today operators need solutions to make existing networks evolve to support **5G introduction** and its promises
  - 5G demands a highly dense grid. This is acknowledged also by FCC (“FCC Acts to Speed 5G Rollouts”):  
*“The FCC estimates that hundreds of thousands of these small cells will have to be built in the next five years to implement the infrastructure necessary to deliver super high speed, super high bandwidth service at millimeter wave frequencies that are only effective over short distances”*
- Not all cell sites are served by fiber (especially at street level with 5G mmWave and small cells), but **uWave/mmWave transport technology** and especially E-band 70/80 GHz have evolved to provide the necessary KPIs
- Antenna gain rules on E-band backhaul need to be amended to enable new scenarios linked to 5G densification at street level (**38dBi** antennas needs to be allowed)

## 5G Densification



The image features the Nokia logo in a light blue, semi-transparent font, centered horizontally. The background is a dark, out-of-focus scene of city lights at night, creating a bokeh effect with numerous circular light spots in shades of yellow, orange, and red. The overall composition is clean and modern, with the logo standing out against the vibrant, blurred background.

NOKIA